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Primary Plasmacytoma at the Site of Exit Wounds After Electrical Injury

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We report a case of primary plasmacytoma occurring 12 years after electrical injury. Roentgenograms showed multiple well-circumscribed lytic lesions involving both the right and left tibial diaphyseal regions. Bone biopsy from the left tibial region showed sheets of monoclonal myeloma cells. No evidence of multiple myeloma was found. The patient was treated with local radiation to both tibias and had no evidence of recurrence 6 years later. In conclusion, we report the first case of primary plasmacytoma of both tibias that occurred after electrical injury 12 years before. Am. J. Hematol. 58:77–79, 1998. © 1998 Wiley-Liss, Inc.

Key words: plasmacytoma; electric injuries; exit wounds; tibia

INTRODUCTION

Solitary plasmacytoma is an uncommon disease. It represents about 3% of all plasma cell dyscrasias [1]. To meet the diagnostic criteria, there must be a radiographically confirmed plasmacytoma with no evidence of multiple myeloma. It usually involves bone [spine, appendicular skeleton (mostly proximal), skull, rib, pelvis, sternum], but may involve extramedullary areas. There are fewer than 10 cases of primary plasmacytomas occurring below the knee [2–5]. The etiology or predisposing factors are unknown. We report the first case of plasmacytoma of both tibias at the site of the exit wound of an electrical injury 12 years earlier.

CASE REPORT

A 27-year-old white man was seen at the local emergency room in 1978 because of a high voltage electrical burn. He had contacted an electrical wire while kneeling with a piece of metal in his left hand. The current passed through his left hand to the body and exited below the knees. Physical examination revealed second- to third-degree burns involving 30–40% of his body. Emergency decompressive fasciotomy of the left forearm was done to restore peripheral circulation. He gradually recovered from the burn and was discharged after a 2-month hospitalization. He had a sensory deficit involving the left radial and medial nerves and bilateral peroneal nerve palsy.

Twelve years later, he was seen again because of indurated tender lesions in the mid shaft of both tibias of 6-month duration. Physical examination revealed a spastic gait and multiple scars at the sites of his previous electrical burns. Roentgenograms (Fig. 1) showed multiple circumscribed lytic abnormalities involving the right and left tibial diaphyseal regions. On the left, the largest defect (5 × 2 cm) occupied much of the medullary canal of the mid left tibia and extended into the anterior cortex. There was a 2-cm lytic lesion in the distal diaphysis of the right tibia. MRI demonstrated bone marrow signal abnormality in the tibial diaphyseal regions bilaterally consistent with marrow replacement. A metastatic bone survey showed no other lytic lesions. Bone biopsy (Fig. 2) of the left tibia revealed sheets of plasma cells that stained only with lambda light chain antiserum. A bone marrow aspiration and biopsy were nondiagnostic. The bone marrow showed 1% cytoplasmic immunoglobulin positive cells with 0.0% labeling index. No peripheral blood plasma cells were seen.

Serum protein electrophoresis showed a small abnormal peak in the beta-gamma region, which consisted of a

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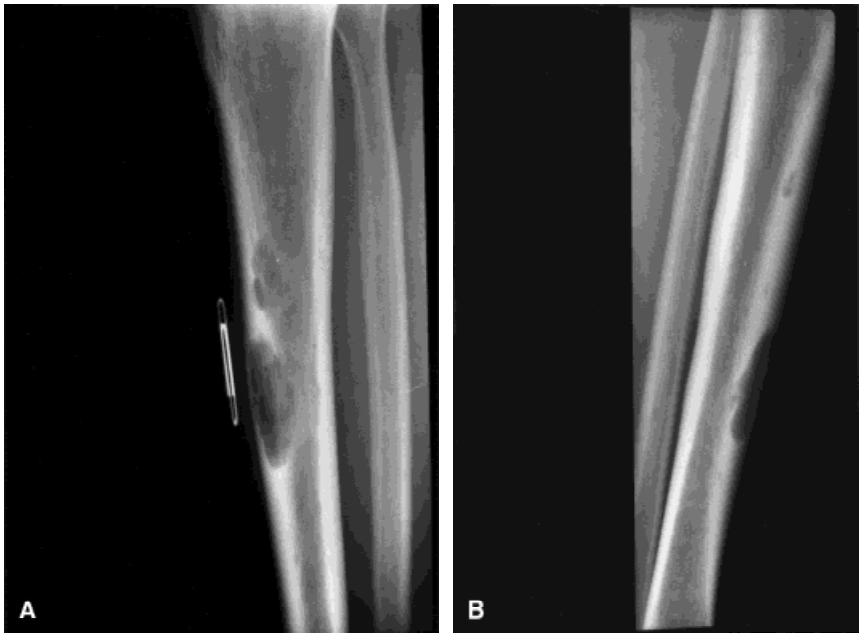

Fig. 1. The X ray of both tibias showed multiple circumscribed lytic lucent diaphyseal abnormalities. A: Left leg. B: Right leg.

monoclonal IgG lambda protein that was too small to measure. The quantitative immunoglobulins were IgA 132 mg/L, IgM 110 mg/L, and IgG 1,200 mg/L. A 24-hr urine specimen contained 43 mg of protein but immunofixation was negative. The hemoglobin was 15.3 g/dL, calcium 9.9 mg/dL, albumin 4.8 g/dL, and creatinine 1.0 mg/dL. His beta 2 microglobulin was 0.8 μg/ml (normal <2.7). A diagnosis of isolated plasmacytomas of both tibias was made and treated with local radiation (40 cGy). This provided significant symptom relief. The monoclonal protein disappeared 9 months after therapy. In December 1996, 6 years later, he was doing well without clinical evidence of multiple myeloma. A skeletal survey showed no new lesions and the old ones had decreased in size. No M-protein in serum and urine was detected by immunoelectrophoresis and immunofixation. A bone marrow aspiration showed 0.4% polyclonal plasma cells with normal hematopoiesis.

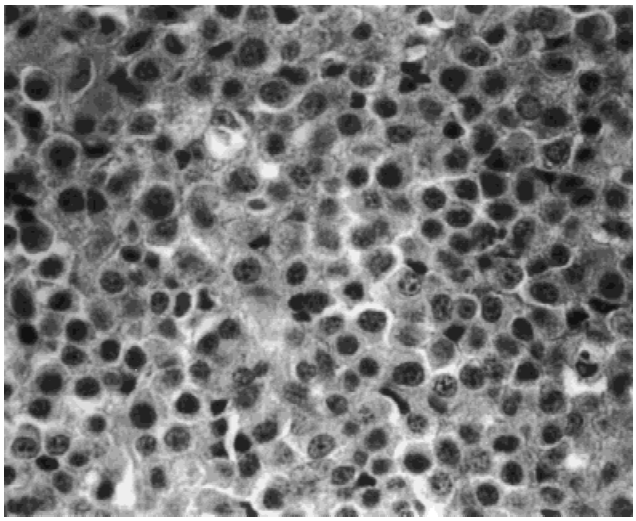

Fig. 2. Bone biopsy of left tibia showed a sheet of plasma cells.

DISCUSSION

Solitary plasmacytoma of bone is an uncommon plasma cell dyscrasia, especially when it occurs below the knee. There are fewer than 10 cases reported in the world literature [2–5]. The diagnosis of solitary plasmacytoma is based on histologic evidence of a tumor consisting of monoclonal plasma cells and complete skeletal radiographs must show no other lesions. The bone marrow aspirate and biopsy must contain no evidence of multiple myeloma. Immunoelectrophoresis and immunofixation of the serum and concentrated urine usually show no M-protein after effective treatment of the plasmacytoma.

We report a 40-year-old patient with unusual isolated plasmacytomas of both tibias. The lesions localized at the area of exit wounds of electrical current that he had from a high-voltage injury 12 years before. This is the first case of a plasmacytoma developing after electrical injury. The role of the electrical injury as a transforming factor is not known. Possibilities include a direct mutation in the plasma cells, or changes in the stromal cells at both sites. In view of the bilateral tibial location of the plasmacytoma and the lack of recurrence of other sites, the latter mechanism likely played a major role. As previously demonstrated, clonal precursor cells have been identified that evolve into myeloma [6–11], and also a

microenvironment with stromal cells in bone marrow that support myeloma cell growth [6,10]. Tissue including stromal cells and fibroblasts exposed to the electrical current can survive and heal. This tissue may provide cytokines such as interleukin-6 and interleukin-3 [6,12–14], which contribute to the growth of plasma cells.

We treated this patient with local radiation, which resulted in the disappearance of pain and the serum M-protein. Six years later there was no evidence of recurrent plasmacytoma or multiple myeloma.

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